MARCH 18 , 2020 / PAC WEBEX

ISO-NE Winter 2019/20 Review

Planning Advisory Committee (PAC)

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RESOURCE STUDIES & ASSESSMENTS – PLANNING SERVICES

Table of Contents

Actual Winter Weather, Energy & Peak Loads

Winter Weather, Energy and Peak Loads*

- **December 2019: Colder than previous December (2018)**
  - Monthly Heating Degree Days of 995 is 1.93% higher than December 2018
  - Energy demand of 10,652 GWh is 1.1% higher than December 2018
  - Peak load of 19,033 MW is 3.1% higher than December 2018
  - Monthly peak load occurred on December 19, 2019 at HE 18:00 at 18^{O}F and 1^{O} DWPT

- **January 2020: Warmer than previous January (2019)**
  - Monthly Heating Degree Days of 976.2 is 18.0% lower than January 2019
  - Energy demand of 10,393 GWh is 6.2% lower than January 2019
  - Peak load of 18,076 MW is 13.0% lower than January 2019
  - Monthly peak load occurred on January 20, 2020 at HE 18:00 at 24^{O}F and - 2 ^{O} DWPT

*** All data on this slide obtained from the ISO-NE Net Energy and Peak Load Report located at:**
https://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/net-ener-peak-load

Winter Weather, Energy and Peak Loads* - cont'd

- **February 2020: Warmer than previous February (2019)**
  - Monthly Heating Degree Days of 907 is 8.0% lower than February 2019
  - Energy demand of 9,468 GWh is 4.2% lower than February 2019
  - Peak load of 16,961 MW is 8.7% lower than February 2019
  - Monthly peak load occurred on February 14, 2020 at HE 19:00 at 18^{O}F and -6^{O} DWPT

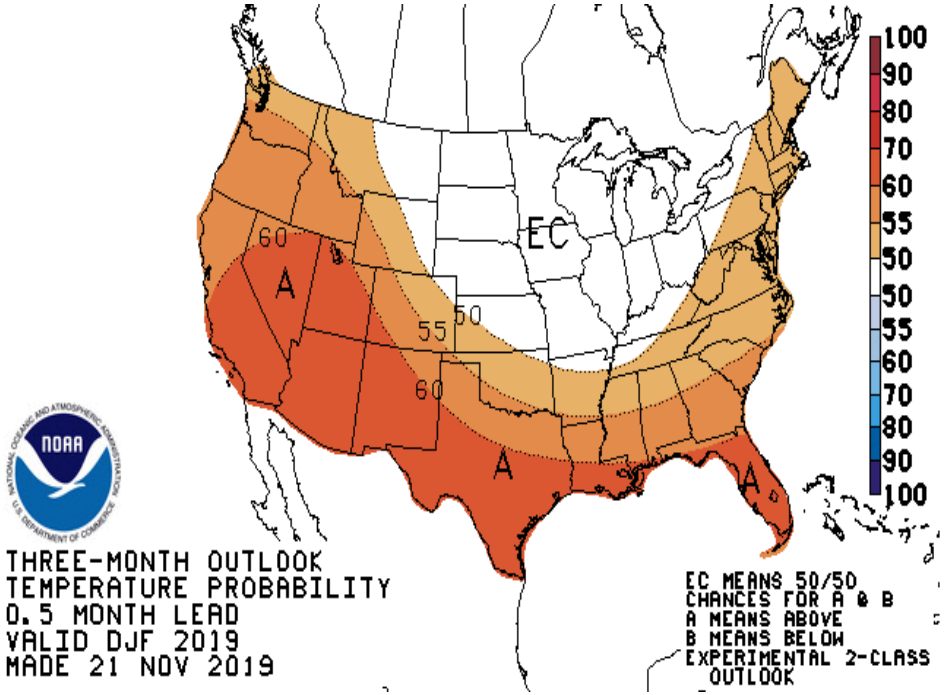
*** All data on this slide obtained from the ISO-NE Net Energy and Peak Load Report located at:**
https://www.iso-ne.com/isoexpress/web/reports/load-and-demand/-/tree/net-ener-peak-load

Review of Winter Operations & Observations

Winter Highlights

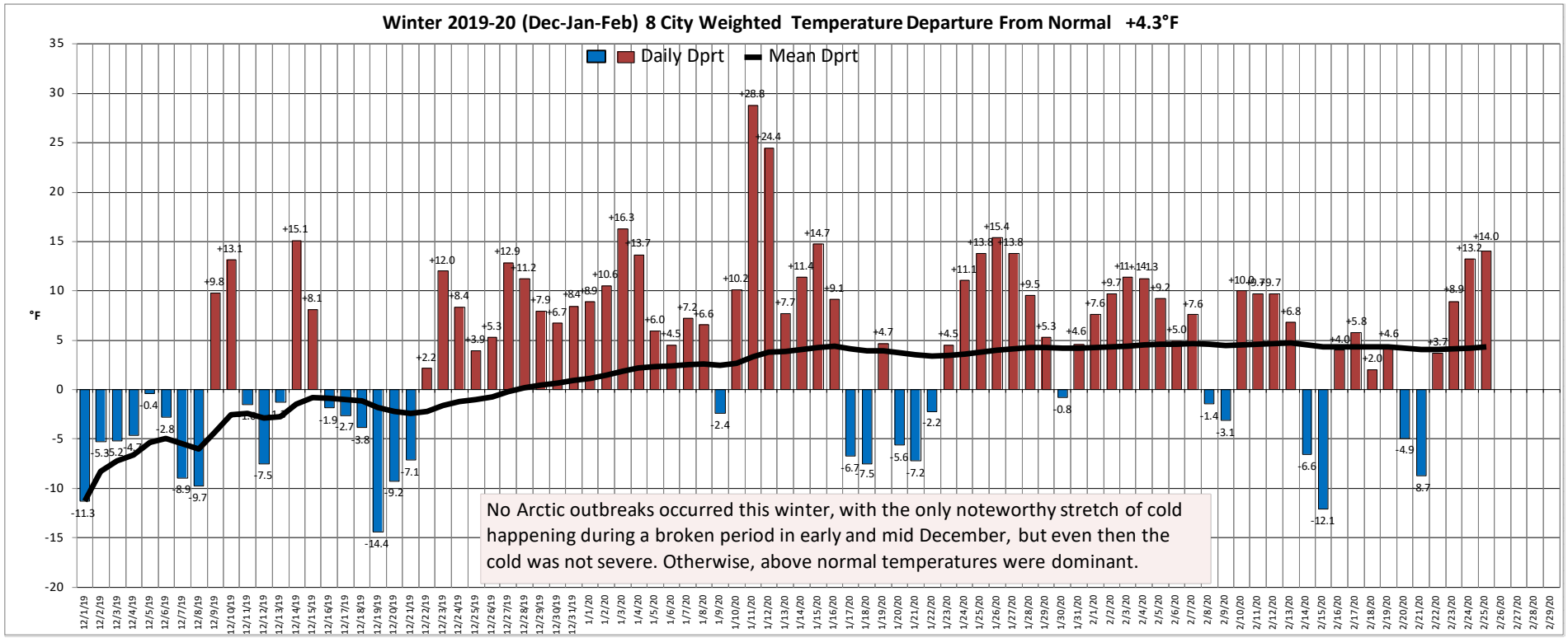
- The New England winter average temperature of +4.3°F was consistent with NOAA's seasonal outlook issued November 21, 2019 of above normal temperatures
- Minimal reductions in natural gas availability to generation
- Fuel oil usage was minimal and supplies remained steady throughout the winter
- Generation fleet and transmission system performed well
- Surplus generation capacity was available throughout the winter
- No MLCC-2 (Abnormal Conditions Alert) or OP-4 (Capacity Deficiency) actions were implemented

Observed Winter Temperatures (Dec 19-Feb 20)



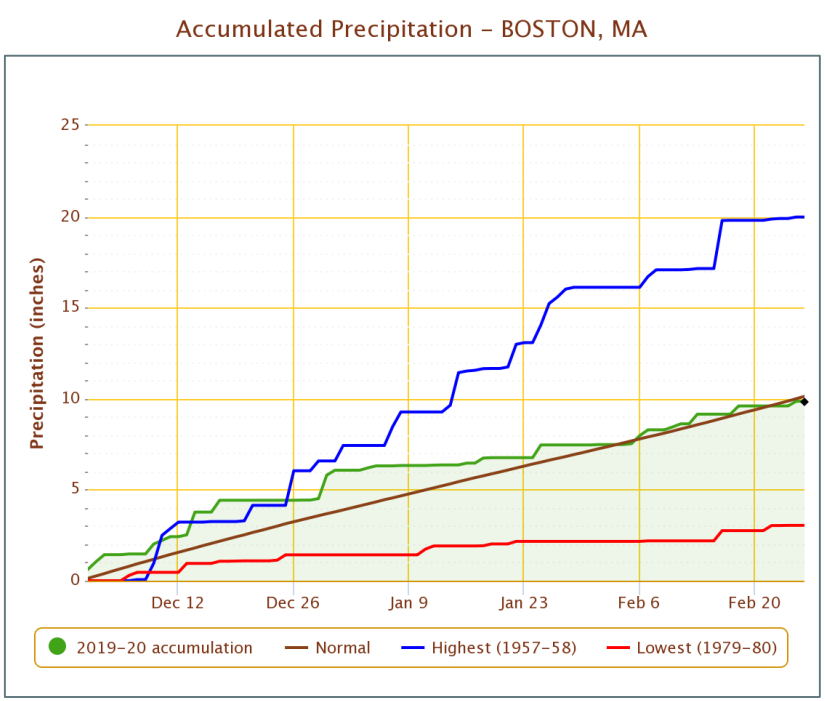
- 17 out of the first 21 days in December were below normal, which was the longest cold stretch of the winter
- That cold stretch was not severe however, as only two of the days were at least 10°F below normal

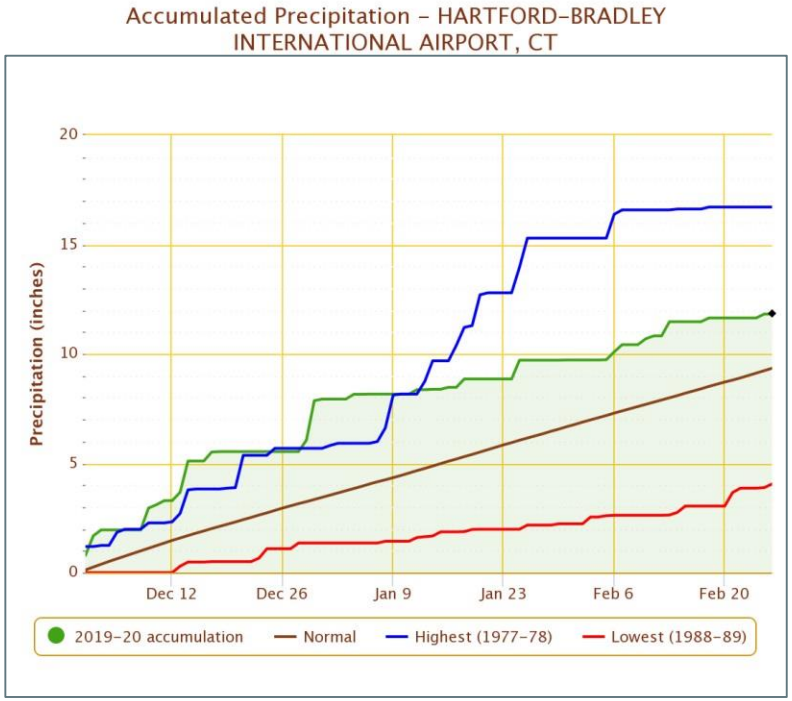
Winter Temperatures (Dec 19-Feb 20)



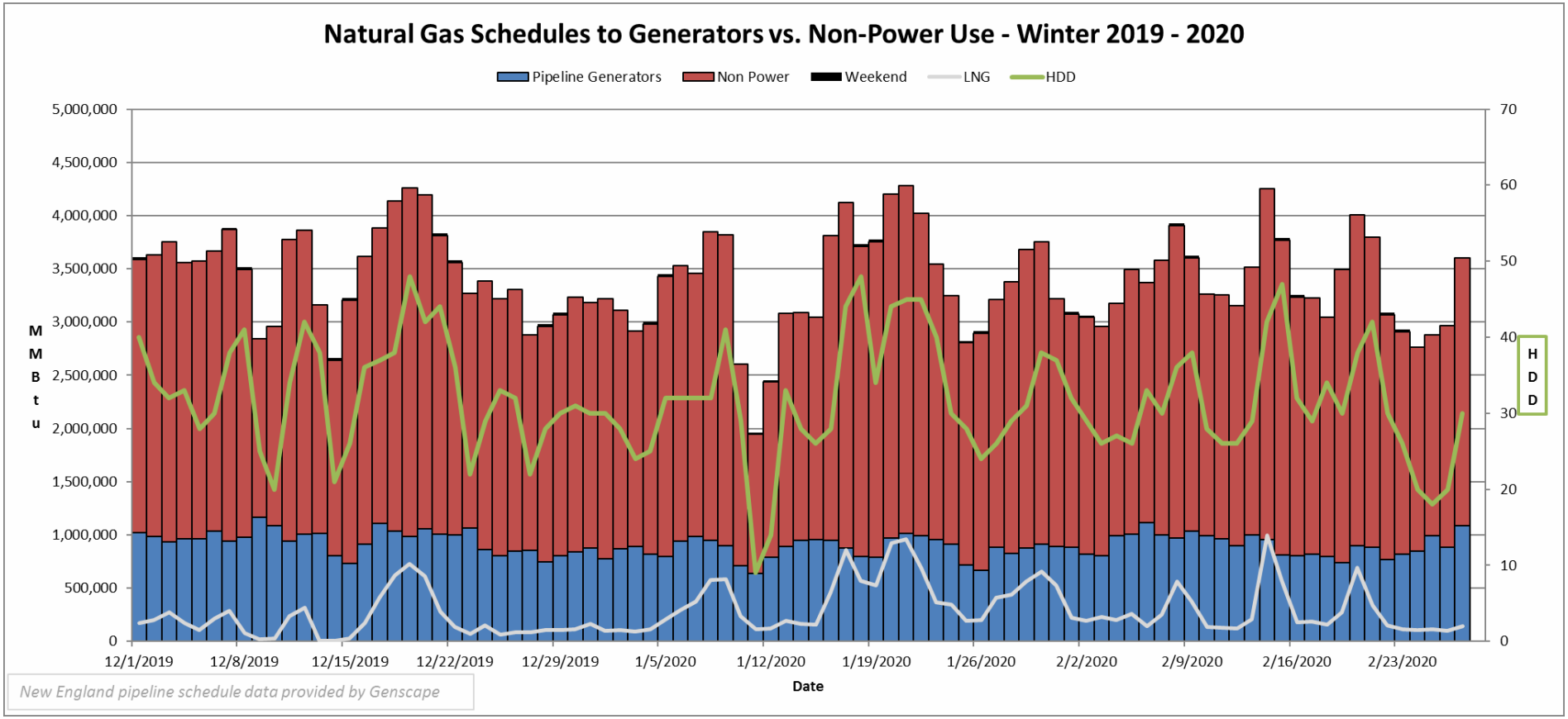
Observed Winter Precipitation (Dec 19-Feb 20)

- Boston
  - Total precipitation was 0.1 inches below normal
  - 15.1” of snowfall recorded, which was 16.6” below normal
- Hartford
  - Total precipitation was 2.6 inches above normal
  - 25.7” of snowfall recorded, which was 4.2” below normal

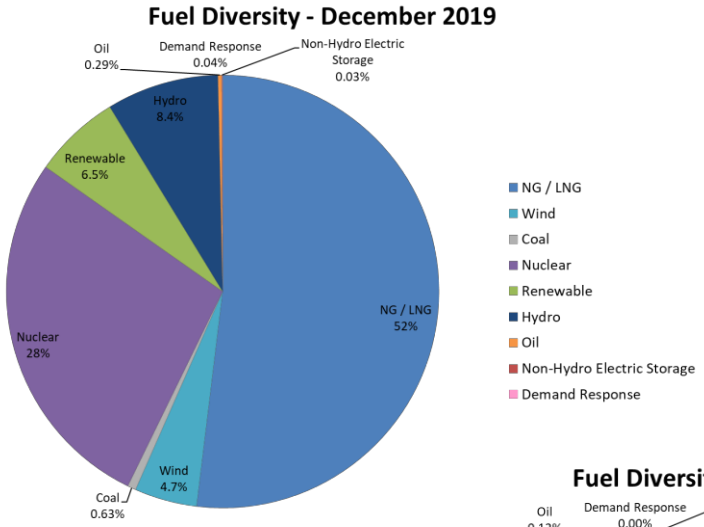


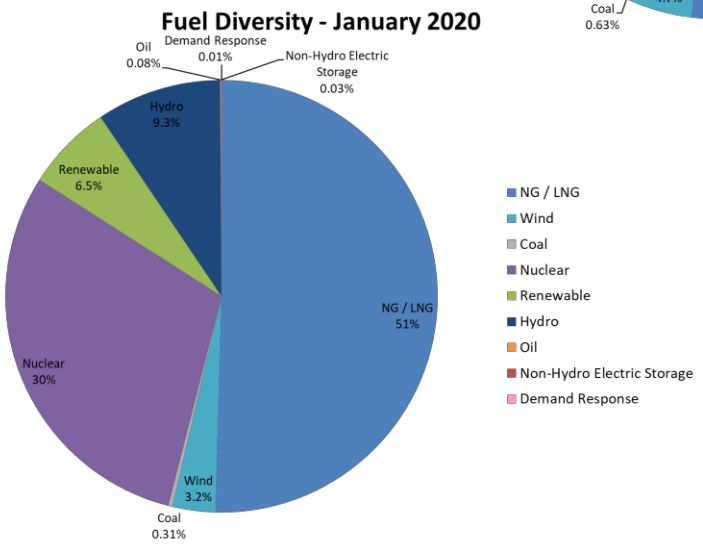


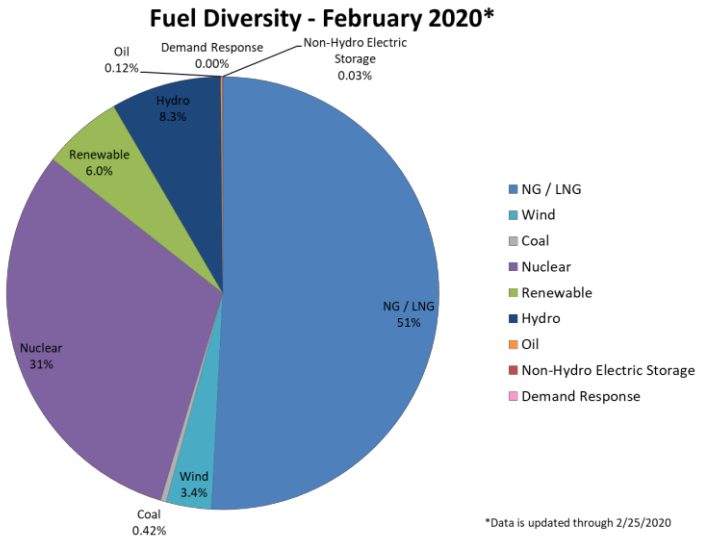
Winter Natural Gas Schedules



Winter Fuel (Energy) Diversity







Winter Observations

- Actual Winter Demand
  - Actual winter peak demand was 18,913** MW on December 19, 2019, HE 18:00
- Transmission System & Transfer Capability
  - New England transmission system performed well
  - Transfer capability on the New York Northern AC ties was increased from 1,400 to 1,500 MW for the winter period
- Natural Gas Supply and Demand
  - Overall, peak natural gas demand was slightly lower than previous years
  - Scheduled LNG injections were less than last winter by approximately 4 Bcf
    - No Excelerate LNG ship this winter
- Algonquin pipeline pressure restrictions
  - Reductions lifted in early December
  - Minimal impact on generation
- No Pay-for-Performance (PFP) events occurred this winter

**** Preliminary operations data based on EMS Telemetering (non-revenue quality metering)**

Winter Observations - cont.

- Fuel and Emissions Availability and Emissions Restrictions
  - Fuel inventories and potential emissions restrictions of oil, coal, and natural-gas-fired resources were monitored throughout the winter via weekly surveys
  - Oil tanks entered Winter 2019/20 at approximately 52% full and ended at approximately 54% full
- Winter Capacity
  - Generation fleet performed well overall throughout the winter
  - Actual lowest observed margin was 530 MW on December 20, 2019
- No Opportunity Cost Mechanisms - Extended cold weather did not occur this winter, as a result there was no need to utilize the opportunity cost mechanisms
- No OP-21 Alerts/Emergencies - Forecast energy surplus did not drop below 5,000 MW for any hour in any of the 21-day forecasts this winter
  - For more information on ISO OP-21 *"Energy Inventory Accounting and Actions During An Energy Emergency,"* please reference: ***https://www.iso-ne.com/static-assets/documents/rules_proceds/operating/isone/op21/op21_rto_final.pdf***

Monthly Operational Review & OpCap Analysis

Monthly Operational Review
December 2019

December 2019 Forecasts & Actuals

- The December 1, 2019 publication of ISO-NE's Operable Capacity Analysis forecast the lowest 50/50 (+2,448 MW) and 90/10 (+1,284 MW) Winter Operable Capacity Margins for week beginning January 11, 2020
  - Actual December peak demand was 19,913 MW** at HE 18:00 on December 19, 2019 with a peak hour capacity margin of X,XXX MW
- December 2019 natural gas prices were 41% higher than November 2019 average values
- Average December 2019 natural gas prices and RT Hub LMPs were down 18% and up 2.2%, respectively, from December 2018 averages

**** Preliminary operations data based on EMS Telemetering (non-revenue quality metering)**

OPERABLE CAPACITY ANALYSIS

December 1, 2019 - Winter 2019/20 Analysis

Winter 2019/20 Operable Capacity Analysis (Dec 1, 2019)

50/50 Load Forecast (Reference)	January - 2020[2] CSO (MW)	January - 2020[2] SCC (MW)
Operable Capacity MW [1]	31,365	33,502
Active Demand Capacity Resource (+) [5]	436	332
External Node Available Net Capacity, CSO imports minus firm capacity exports (+)	917	917
Non Commercial Capacity (+)	28	28
Non Gas-fired Planned Outage MW (-)	510	532
Gas Generator Outages MW (-)	0	0
Allowance for Unplanned Outages (-) [4]	2,800	2,800
Generation at Risk Due to Gas Supply (-) [3]	4,207	4,648
Net Capacity (NET OPCAP SUPPLY MW)	25,229	26,799
Peak Load Forecast MW(adjusted for Other Demand Resources) [2]	20,476	20,476
Operating Reserve Requirement MW	2,305	2,305
Operable Capacity Required (NET LOAD OBLIGATION MW)	22,781	22,781
Operable Capacity Margin	2,448	4,018

[1]Operable Capacity is based on data as of **November 18, 2019** and does not include Capacity associated with Settlement Only Generators, Passive and Active Demand Response, and external capacity. The Capacity Supply Obligation (CSO) and Seasonal Claim Capability (SCC) values are based on data as of **November 18, 2019.**

[2] Load forecast that is based on the 2019 CELT report and represents the week with the lowest Operable Capacity Margin, week beginning **January 11, 2020.**

[3] Total of (Gas at Risk MW) – (Gas Gen Outages MW).

[4] Allowance For Unplanned Outage MW is based on the month corresponding to the day with the lowest Operable Capacity Margin for the week.

[5] Active Demand Capacity Resources (ADCRs) can participate in the Forward Capacity Market (FCM), have the ability to obtain a CSO and also participate in the Day-Ahead and Real-Time Energy Markets.

Winter 2019/20 Operable Capacity Analysis (Dec 1, 2019)

90/10 Load Forecast (Extreme)	January - 2020[2] CSO (MW)	January - 2020[2] SCC (MW)
Operable Capacity MW [1]	31,365	33,502
Active Demand Capacity Resource (+) [5]	436	332
External Node Available Net Capacity, CSO imports minus firm capacity exports (+)	917	917
Non Commercial Capacity (+)	28	28
Non Gas-fired Planned Outage MW (-)	510	532
Gas Generator Outages MW (-)	0	0
Allowance for Unplanned Outages (-) [4]	2,800	2,800
Generation at Risk Due to Gas Supply (-) [3]	4,674	5,165
Net Capacity (NET OPCAP SUPPLY MW)	24,762	26,282
Peak Load Forecast MW(adjusted for Other Demand Resources) [2]	21,173	21,173
Operating Reserve Requirement MW	2,305	2,305
Operable Capacity Required (NET LOAD OBLIGATION MW)	23,478	23,478
Operable Capacity Margin	1,284	2,804

[1]Operable Capacity is based on data as of **November 18, 2019** and does not include Capacity associated with Settlement Only Generators, Passive and Active Demand Response, and external capacity. The Capacity Supply Obligation (CSO) and Seasonal Claim Capability (SCC) values are based on data as of **November 18, 2019.**

[2] Load forecast that is based on the 2019 CELT report and represents the week with the lowest Operable Capacity Margin, week beginning **January 11, 2020.**

[3] Total of (Gas at Risk MW) – (Gas Gen Outages MW)**.**

[4] Allowance For Unplanned Outage MW is based on the month corresponding to the day with the lowest Operable Capacity Margin for the week.

[5] Active Demand Capacity Resources (ADCRs) can participate in the Forward Capacity Market (FCM), have the ability to obtain a CSO and also participate in the Day-Ahead and Real-Time Energy Markets.

Winter 2019/20 Operable Capacity Analysis

50/50 Forecast (Reference)

ISO-NE OPERABLE CAPACITY ANALYSIS

December 1, 2019 - 50-50 FORECAST using CSO

This analysis is a tabulation of weekly assessments shown in one single table. The information shows the operable capacity situation under assumed conditions for each week. It is not expected that the system peak will occur every week during June, July, August, and Mid September

STUDY WEEK (Week Beginning, Saturday)	AVAILABLE OPCAP MW	Active Capacity Demand MW	EXTERNAL NODE AVAIL CAPACITY MW	NON COMMERCIAL CAPACITY MW	NON-GAS PLANNED OUTAGES CSO MW	GAS GENERATOR OUTAGES CSO MW	ALLOWANCE FOR UNPLANNED OUTAGES MW	GAS AT RISK MW	NET OPCAP SUPPLY MW	PEAK LOAD FORECAST MW	OPER RESERVE REQUIREMENT MW	NET LOAD OBLIGATION MW	OPCAP MARGIN MW
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
11/30/2019	31300	413	971	28	1442	333	3200	2325	25412	19232	2305	21537	3875
12/7/2019	31300	413	971	28	1108	333	3200	2786	25285	19532	2305	21837	3448
12/14/2019	31300	413	1071	28	569	333	3200	2968	25742	19543	2305	21848	3894
12/21/2019	31300	413	971	28	15	0	3200	3621	25876	19608	2305	21913	3963
12/28/2019	31300	413	971	28	15	0	3200	3967	25530	19993	2305	22298	3232
1/4/2020	31365	436	917	28	351	279	2800	3806	25510	20476	2305	22781	2729
1/11/2020	**31365**	**436**	**917**	**28**	**510**	**0**	**2800**	**4207**	**25229**	**20476**	**2305**	**22781**	**2448**
1/18/2020	31365	436	917	28	484	0	2800	4014	25448	20476	2305	22781	2667
1/25/2020	31365	436	917	28	477	0	2800	3737	25732	20245	2305	22550	3182
2/1/2020	31344	456	917	28	565	0	3100	3737	25343	19967	2305	22272	3071
2/8/2020	31344	456	917	28	565	0	3100	3322	25758	19937	2305	22242	3516
2/15/2020	31344	456	917	28	498	0	3100	3045	26102	19664	2305	21969	4133
2/22/2020	31344	456	917	28	418	0	3100	2492	26735	18636	2305	20941	5794
2/29/2020	31344	456	917	28	1282	0	2200	2076	27187	18273	2305	20578	6609
3/7/2020	31344	456	917	28	1239	0	2200	1938	27368	18069	2305	20374	6994
3/14/2020	31344	456	917	28	1619	647	2200	737	27542	17690	2305	19995	7547
3/21/2020	31344	456	917	28	2235	650	2200	319	27341	17102	2305	19407	7934

1.Available OPCAP MW based on resource Capacity Supply Obligations, CSO. Does not include Settlement Only Generators.
2.The active demand resources known as Real-Time Demand Response (RTDR) will become Active Demand Capacity Resources (ADCRs) and can participate in the Forward Capacity Market (FCM). These resources will have the ability to obtain a CSO and also participate in the Day-Ahead and Real-Time Energy Markets.
3. External Node Available Capacity MW based on the sum of external Capacity Supply Obligations (CSO) imports and exports.
4. New resources and generator improvements that have acquired a CSO but have not become commercial.
5. Non-Gas Planned Outages is the total of Non Gas-fired Generator/DARD Outages for the period. This value would also include any known long-term Non Gas-fired Forced Outages.
6. All Planned Gas-fired generation outage for the period. This value would also include any known long-term Gas-fired Forced Outages.
7. Allowance for Unplanned Outages includes forced outages and maintenance outages scheduled less than 14 days in advance per ISO New England Operating Procedure No. 5 Appendix A.
8. Generation at Risk due to Gas Supply pertains to gas fired capacity expected to be at risk during cold weather conditions or gas pipeline maintenance outages.
9. Net OpCap Supply MW Available (1 + 2 + 3 + 4 - 5 - 6 - 7 - 8 = 9)
10.Peak Load Forecast as provided in the 2019 CELT Report and adjusted for Passive Demand Resources assumes Peak Load Exposure (PLE) of 25,323 and does include credit of Passive Demand Response (PDR) and behind-the-meter PV (BTM PV)
11. Operating Reserve Requirement based on 120% of first largest contingency plus 50% of the second largest contingency.
12. Total Net Load Obligation per the formula(10 + 11 = 12)
13. Net OPCAP Margin MW = Net Op Cap Supply MW minus Net Load Obligation (9 - 12 = 13)

Winter 2019/20 Operable Capacity Analysis

90/10 Forecast (Extreme)

ISO-NE OPERABLE CAPACITY ANALYSIS

December 1, 2019 - 90-10 FORECAST using CSO

This analysis is a tabulation of weekly assessments shown in one single table. The information shows the operable capacity situation under assumed conditions for each week. It is not expected that the system peak will occur every week during June, July, August, and Mid September

STUDY WEEK (Week Beginning, Saturday)	AVAILABLE OPCAP MW	Active Capacity Demand MW	EXTERNAL NODE AVAIL CAPACITY MW	NON COMMERCIAL CAPACITY MW	NON-GAS PLANNED OUTAGES CSO MW	GAS GENERATOR OUTAGES CSO MW	ALLOWANCE FOR UNPLANNED OUTAGES MW	GAS AT RISK MW	NET OPCAP SUPPLY MW	PEAK LOAD FORECAST MW	OPER RESERVE REQUIREMENT MW	NET LOAD OBLIGATION MW	OPCAP MARGIN MW
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]
11/30/2019	31300	413	971	28	1442	333	3200	2620	25117	19886	2305	22191	2926
12/7/2019	31300	413	971	28	1108	333	3200	3132	24939	20194	2305	22499	2440
12/14/2019	31300	413	1071	28	569	333	3200	3335	25375	20206	2305	22511	2864
12/21/2019	31300	413	971	28	15	0	3200	4023	25474	20273	2305	22578	2896
12/28/2019	31300	413	971	28	15	0	3200	4408	25089	20674	2305	22979	2110
1/4/2020	31365	436	917	28	351	279	2800	4260	25056	21173	2305	23478	1578
1/11/2020	**31365**	**436**	**917**	**28**	**510**	**0**	**2800**	**4674**	**24762**	**21173**	**2305**	**23478**	**1284**
1/18/2020	31365	436	917	28	484	0	2800	4460	25002	21173	2305	23478	1524
1/25/2020	31365	436	917	28	477	0	2800	4153	25316	20934	2305	23239	2077
2/1/2020	31344	456	917	28	565	0	3100	4153	24927	20648	2305	22953	1974
2/8/2020	31344	456	917	28	565	0	3100	3691	25389	20617	2305	22922	2467
2/15/2020	31344	456	917	28	498	0	3100	3384	25763	20336	2305	22641	3122
2/22/2020	31344	456	917	28	418	0	3100	2768	26459	19277	2305	21582	4877
2/29/2020	31344	456	917	28	1282	0	2200	2307	26956	18903	2305	21208	5748
3/7/2020	31344	456	917	28	1239	0	2200	2153	27153	18693	2305	20998	6155
3/14/2020	31344	456	917	28	1619	647	2200	891	27388	18302	2305	20607	6781
3/21/2020	31344	456	917	28	2235	650	2200	427	27233	17697	2305	20002	7231

1. Available OPCAP MW based on resource Capacity Supply Obligations, CSO. Does not include Settlement Only Generators.
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7. Allowance for Unplanned Outages includes forced outages and maintenance outages scheduled less than 14 days in advance per ISO New England Operating Procedure No. 5 Appendix A.
8. Generation at Risk due to Gas Supply pertains to gas fired capacity expected to be at risk during cold weather conditions or gas pipeline maintenance outages.
9. Net OpCap Supply MW Available (1 + 2 + 3 + 4 - 5 - 6 - 7 - 8 = 9)
10. Peak Load Forecast as provided in the 2019 CELT Report and adjusted for Passive Demand Resources assumes Peak Load Exposure (PLE) of 27,212 and does include credit of Passive Demand Response (PDR) and behind-the-meter PV (BTM PV)
11. Operating Reserve Requirement based on 120% of first largest contingency plus 50% of the second largest contingency.
12. Total Net Load Obligation per the formula (10 + 11 = 12)
13. Net OPCAP Margin MW = Net Op Cap Supply MW minus Net Load Obligation (9 - 12 = 13)

***Highlighted week is based on the week determined by the 50/50 Load Forecast Reference week**

Actual System Operations – December 2019

Weather Patterns	**Boston**	Temperature: Above Normal (2.5°F) Max: 63°F, Min: 15°F Precipitation: 6.07" – Above Normal Normal: 3.78" Snow: 11.5"	**Hartford**	Temperature: Above Normal (0.1°F) Max: 54°F, Min: 8°F Precipitation: 7.93" - Above Normal Normal: 3.44" Snow: 22.0"

Peak Load:	18,913 MW**	December 19, 2019	18:00 (hour ending)

Emergency Procedure Events (OP-4, M/LCC 2, Minimum Generation Emergency)

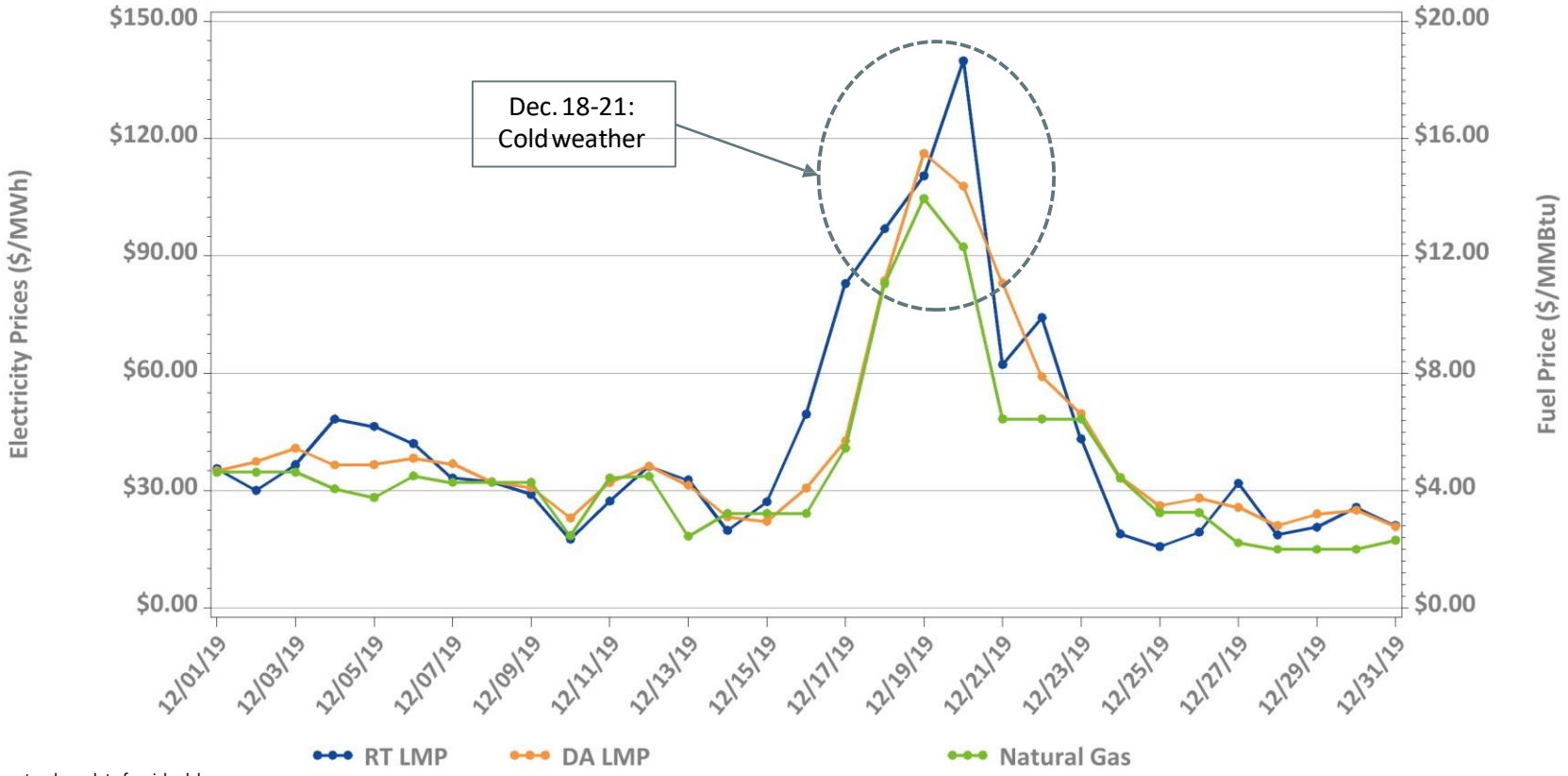
Procedure	Declared	Cancelled	Note
None for December 2019			

NPCC Simultaneous Activation of Reserve Events

Date	Area	MW Lost
12/10/19	IESO	1,400
12/12/19	ISO-NE	562
12/27/19	ISO-NE	867

**** Preliminary operations data based on EMS Telemetering (non-revenue quality metering)**

Daily Average DA and RT ISO-NE Hub Prices and Input Fuel Prices: December 1-31, 2019

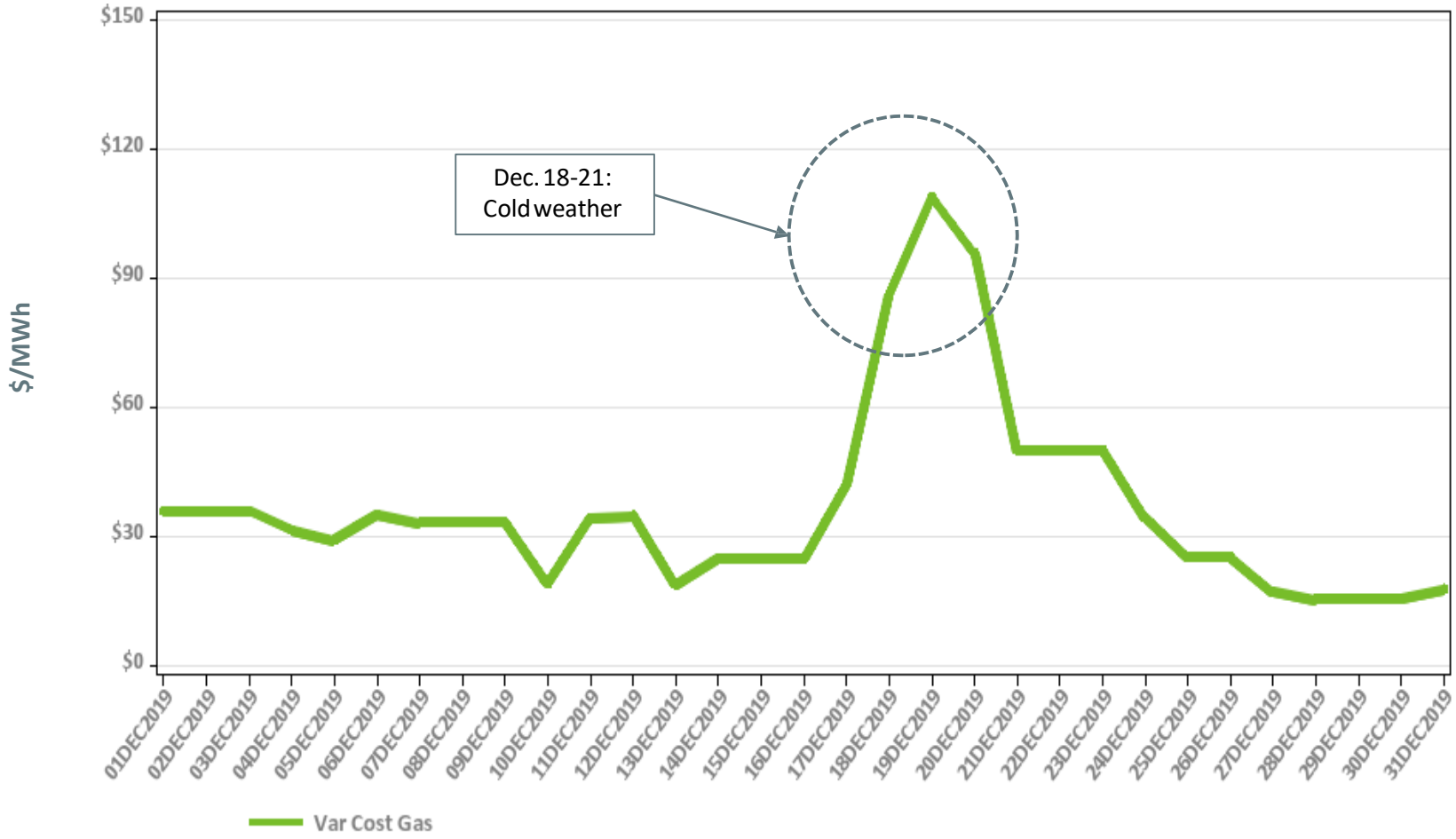


Underlying natural gas data furnished by:

ICE Global markets in clear view

Average price difference over this period (DA-RT): $-1.78
Average price difference over this period ABS(DA-RT): $8.45
Average percentage difference over this period ABS(DA-RT)/RT Average LMP: 20%
Gas price is average of Massachusetts delivery points

Variable Production Cost of Natural Gas: December 2019 Dailies



Note: Assumes proxy heat rate of 7,800,000 Btu/MWh for natural gas units.

Underlying natural gas data furnished by:

ICE Global markets in clear view

Monthly Operational Review
January 2020

January 2020 Forecasts & Actuals

- The December 1, 2019 publication of ISO-NE's Operable Capacity Analysis forecast the lowest 50/50 (+2,448 MW) and 90/10 (+1,284 MW) Winter Operable Capacity Margins for week beginning January 11, 2020
  - Actual January peak demand was 17,934 MW** at HE 18:00 on January 17, 2020 with a peak hour capacity margin of X,XXX MW
- January 2020 natural gas prices were 38% lower than December 2019 average values
- Average January 2020 natural gas prices and RT Hub LMPs were down 58% and 49%, respectively, from January 2019 averages

**** Preliminary operations data based on EMS Telemetering (non-revenue quality metering)**

Actual System Operations – January 2020

Weather Patterns	**Boston**	Temperature: Above Normal (9.0°F) Max: 74°F, Min: 14°F Precipitation: 1.39" – Below Normal Normal: 3.36" Snow: 3.1"	**Hartford**	Temperature: Above Normal (6.9°F) Max: 70°F, Min: 4°F Precipitation: 1.79" – Below Normal Normal: 3.23" Snow: 3.3"

Peak Load:	17,934 MW**	January 20,2020	18:00 (ending)

Emergency Procedure Events (OP-4, M/LCC 2, Minimum Generation Emergency)

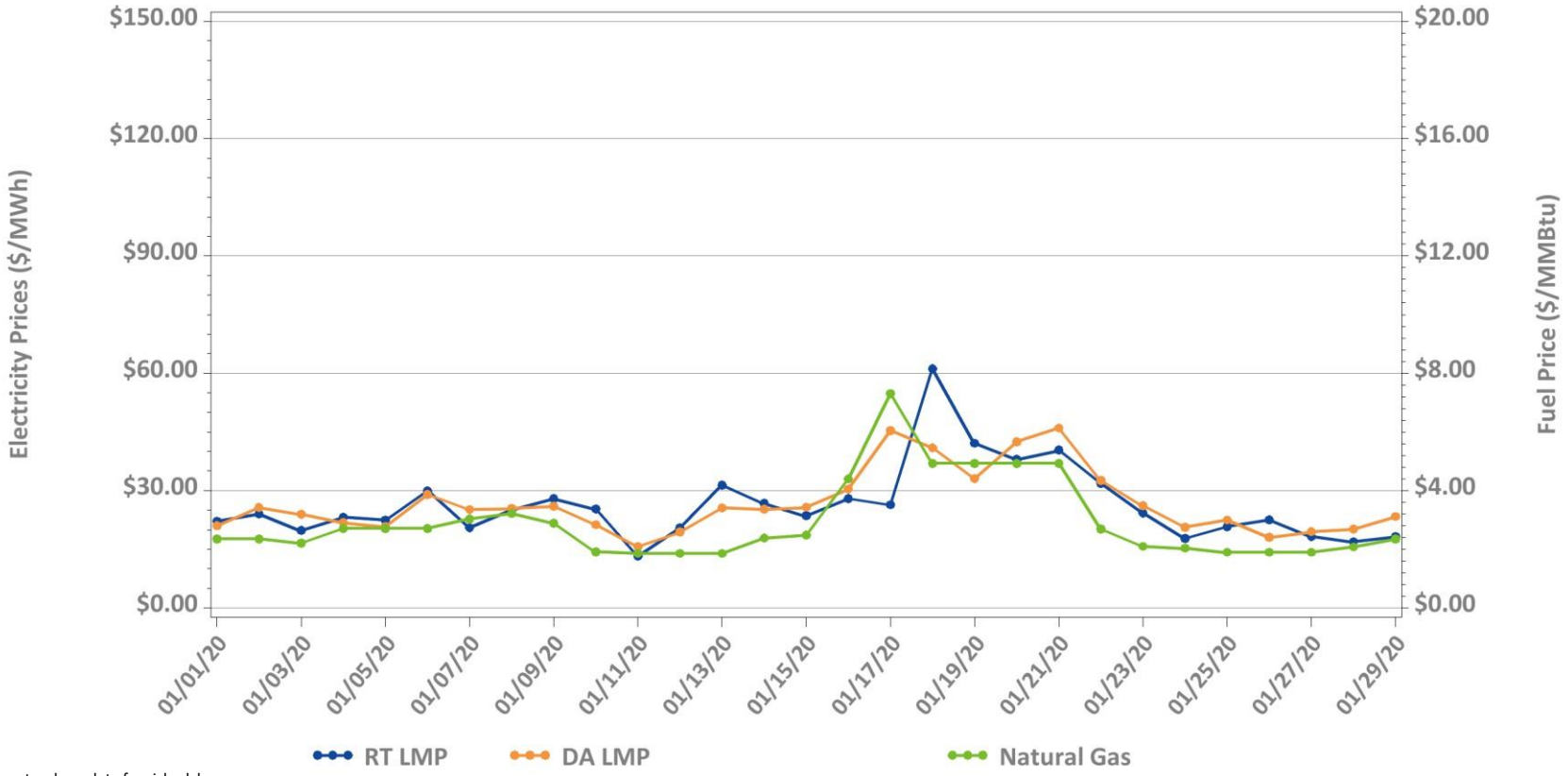
Procedure	Declared	Cancelled	
None for January 2020			

NPCC Simultaneous Activation of Reserve Events

Date	Area	MW Lost
01/13/20	IESO	1,400
01/16/20	NBPSO	350
01/21/20	IESO	880
01/23/20	PJM	1,082
01/31/20	IESO	945

**** Preliminary operations data based on EMS Telemetering (non-revenue quality metering)**

Daily Average DA and RT ISO-NE Hub Prices and Input Fuel Prices: January 1-29, 2020

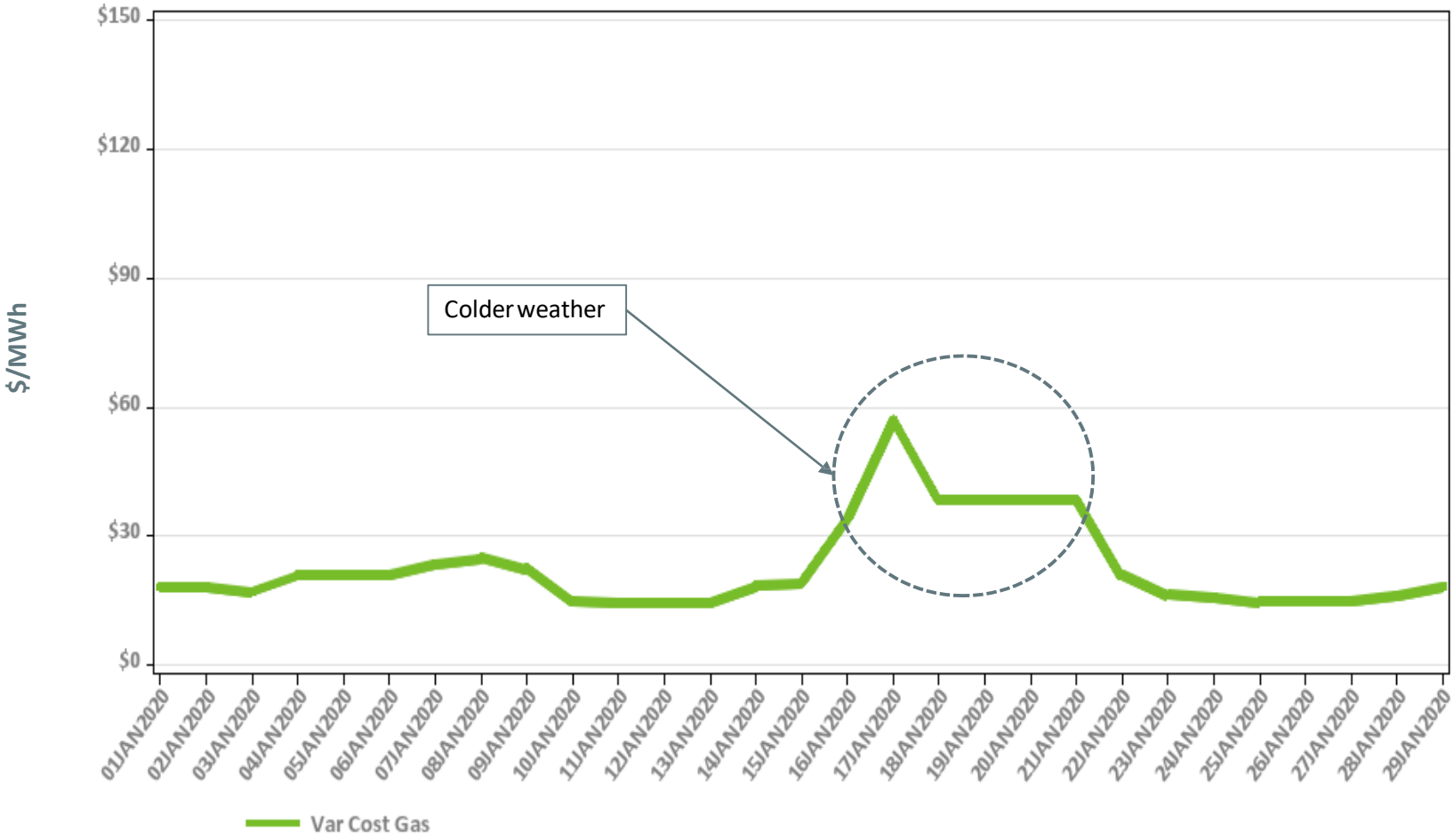


Underlying natural gas data furnished by:

ICE Global markets in clear view

Average price difference over this period (DA-RT): $0.37
Average price difference over this period ABS(DA-RT): $4.04
Average percentage difference over this period ABS(DA-RT)/RT Average LMP: 15%
Gas price is average of Massachusetts delivery points

Variable Production Cost of Natural Gas: January 2020 Dailies



Note: Assumes proxy heat rate of 7,800,000 Btu/MWh for natural gas units.

Underlying natural gas data furnished by:

ICE Global markets in clear view

Monthly Operational Review
February 2020

February 2020 Forecasts & Actuals

- The February 1, 2020 publication of ISO-NE's Operable Capacity Analysis forecast the lowest 50/50 (+3,799 MW) and 90/10 (+1,872 MW) Winter Operable Capacity Margins for week beginning February 1, 2020
  - Actual February peak demand was 16,824 MW** at HE 19:00 on February 14, 2020 with a peak hour capacity margin of X,XXX MW
- February 2020 natural gas prices were 21% lower than January 2020 average values
- Average February 2020 natural gas prices and RT Hub LMPs were down 46% and 45%, respectively, from February 2019 averages

**** Preliminary operations data based on EMS Telemetering (non-revenue quality metering)**

Actual System Operations – February 2020

Weather Patterns	**Boston**	Temperature: Above Normal (6.1°F) Max: 64°F, Min: 12°F Precipitation: 3.30" – Above Normal Normal: 3.25" Snow: 0.5"	**Hartford**	Temperature: Above Normal (4.5°F) Max: 63°F, Min: 6°F Precipitation: 3.19" - Above Normal Normal: 2.89" Snow: 0.4"

Peak Load:	16,824 MW**	February 14, 2020	19:00 (ending)

Emergency Procedure Events (OP-4, M/LCC 2, Minimum Generation Emergency)

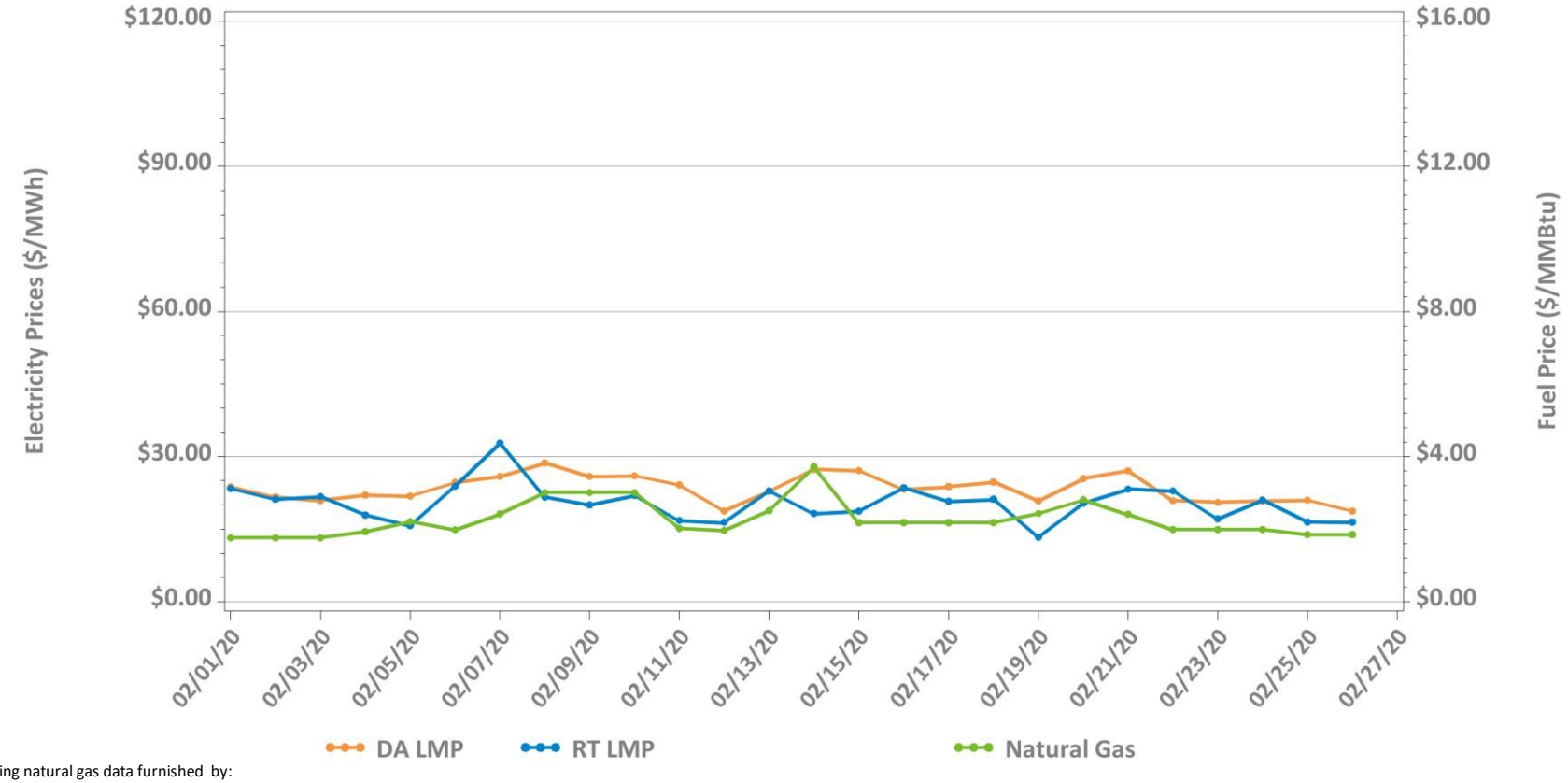
Procedure	Declared	Cancelled	Note
None for February, 2020			

NPCC Simultaneous Activation of Reserve Events

Date	Area	MW Lost
02/03/20	IESO	830
02/18/20	PJM	1,100
02/26/20	NYISO	750

** Preliminary operations data based on EMS Telemetering (non-revenue quality metering)

Daily Average DA and RT ISO-NE Hub Prices and Input Fuel Prices: February 1-26, 2020

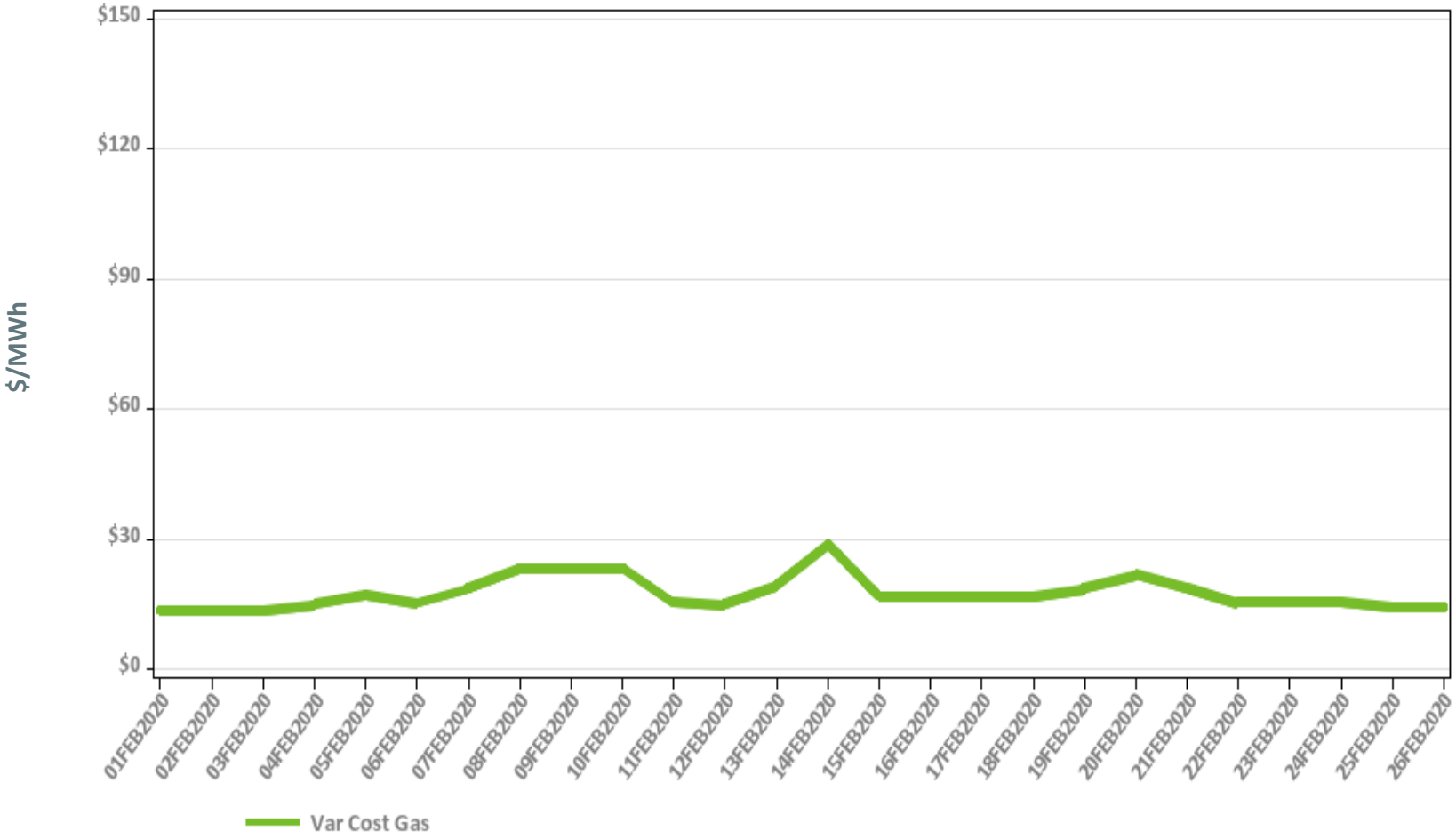


Underlying natural gas data furnished by:

ICE Global markets in clear view

Average price difference over this period (DA-RT): $3.03
Average price difference over this period ABS(DA-RT): $3.84
Average percentage difference over this period ABS(DA-RT)/RT Average LMP: 19%
Gas price is average of Massachusetts delivery points

Variable Production Cost of Natural Gas: February 2020 Dailies



Note: Assumes proxy heat rate of 7,800,000 Btu/MWh for natural gas units.

Underlying natural gas data furnished by:

ICE Global markets in clear view

Natural Gas Operations Review

Natural Gas Operations Review – Issues/Incidents at Gas-Fired Power Stations

Natural Gas Operations Review – Issues/Incidents at Gas-Fired Power Stations

- December 2019:
  - 22 natural gas issues at 3 generating stations
- January 2020:
  - 1 natural gas issue at 1 generating station
- February 2020:
  - 1 natural gas issues at 1 generating station

Total Winter Period (December 2019 – February 2020):

- 24 natural gas issues at 5 generating stations

Natural Gas Operations Review – Declarations of Force Majeure & Operational Flow Orders (OFOs)

Natural Gas Operations Review – Declarations of Force Majeure & OFOs

- Algonquin Gas Transmission (AGT) Force Majeure: One
  - Unplanned outage of the Burrillville Compressor Station on January 11, 2020
- AGT Winter OFOs: Seven (7)
  - 2019: Dec 1-31 (entire month)
  - 2020: Jan 1-10 & Jan 16-24
  - 2020: Feb 8-10, Feb 13-17, Feb 19-22, and Feb 27-Mar 2 (operational integrity)

- Iroquois Gas Transmission System (IGTS) Force Majeure: None
- IGTS Winter OFOs: Three (3)
  - 2019: Dec 17-22 (cold weather/high demand)
  - 2020: Jan 17-22 (cold weather/high demand)
  - 2020: Feb 14-16 (cold weather/high demand)

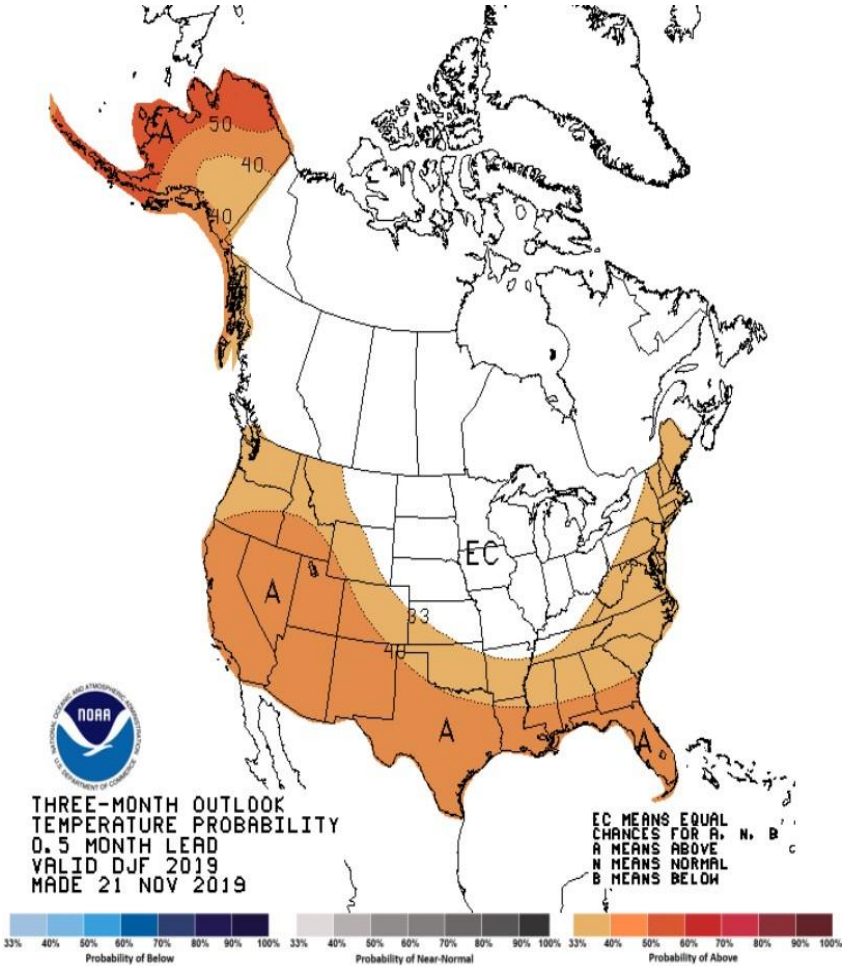
Natural Gas Operations Review – Declarations of Force Majeure & OFOs – cont'd

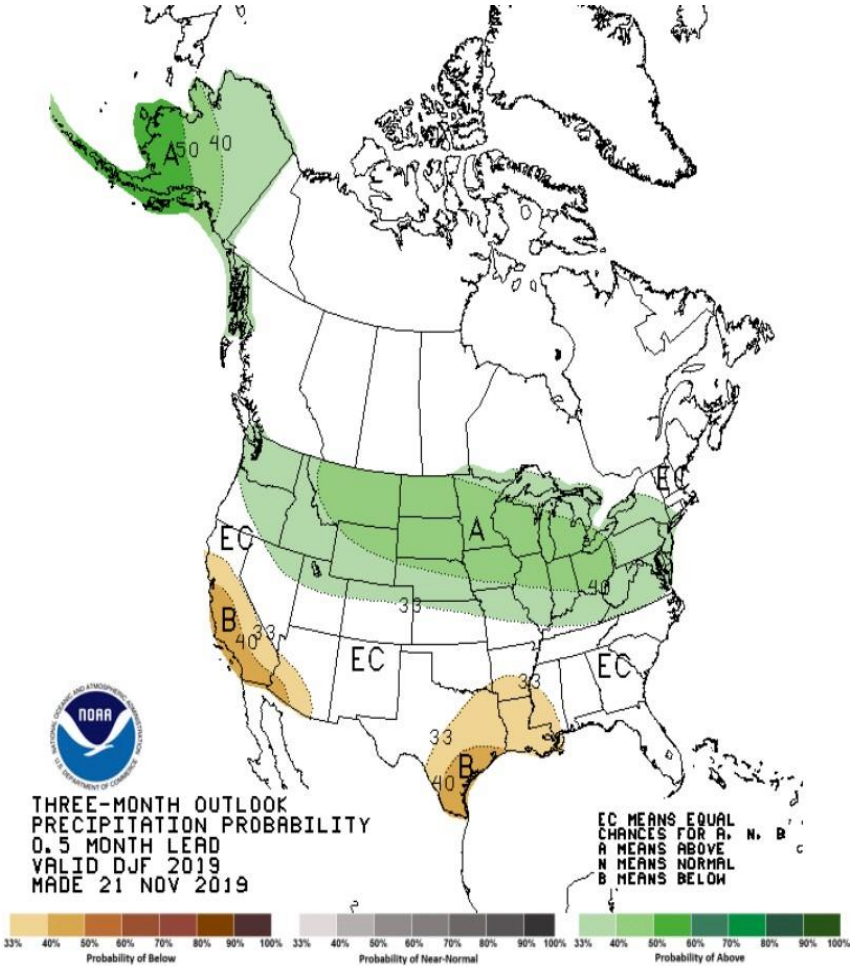
- Maritimes & Northeast (M&N) Pipeline Force Majeure: None
- M&N Winter OFOs: One (1)
  - 2019: Dec = None
  - 2020: Jan 16-20 (operational integrity)
  - 2020: Feb = None
- Tennessee Gas Pipeline (TGP) Force Majeure: None
- TGP Winter OFOs (All types): Ten (10)
  - 2019: Dec 7-9, Dec 12-14, Dec 17-23 (cold weather/high demand)
  - 2020: Jan 7-9, Jan 17-23, Jan 30-31 (cold weather/high demand)
  - 2020: Feb 8-10, Feb 14-16, Feb 20-22, and Feb 29-Mar 2 (cold weather/ high demand)
- Portland Natural Gas Transmission System (PNGTS) Force Majeure and Winter OFOs: None

Questions

Appendix 1 – Winter Readiness

Winter Temperature & Precipitation Probability





Highlights

- Seasonal Outlook
  - The seasonal temperature outlook for the winter months of December-January-February indicated a 33% probability of above normal temperatures for all of New England
  - There was a 33 % probability of above normal precipitation for a portion of southwestern New England. An equal chance for above average or below average precipitation was forecast across the remainder of New England

- Winter 2019/20 Capacity Analysis for the 50/50 and the 90/10 demand forecast indicated a surplus even after accounting for generation at risk due to natural gas supply
  - In case of extended periods of cold weather that impact fuel inventories, the winter 2019/20 Capacity Outlook and OP21 reporting would be adjusted accordingly

Winter Expectations

- Winter Demand Forecast
  - 50/50 winter peak demand forecast of 20,476 MW
  - 90/10 winter peak demand forecast of 21,173 MW

- Scheduled Generation and Transmission Outages
  - All generation and transmission outages have been coordinated to minimize adverse transmission or capacity conditions

- Transfer Capability
  - Transfer capability on the New York Northern AC ties was increased from 1,400 MW to 1,500 MW for the winter period to account for lower ambient air conditions

Winter Expectations - cont.

- Natural Gas Deliverability
  - ISO-NE will continue to monitor natural gas deliverability throughout the winter period
  - Participants should monitor status of fuel availability including interstate natural gas pipeline bulletin boards
  - Inspections continue on the Algonquin Gas Transmission (AGT) System
    - The pipeline inspections were generally positive
- Fuel and Emissions Availability
  - ISO-NE will continue to monitor fuel inventories and potential emissions restrictions of fossil-fueled resources via weekly surveys and move to daily surveys, if necessary
  - Entering Winter 2018/19, regional power plant fuel oil tanks were approximately 50% full and ended that winter approximately 55% full
  - Entering Winter 2019/20, regional power plant fuel oil tanks were approximately 52% full

Winter Preparations

- Winter Readiness Seminar
  - ISO-NE hosted a Generator Winter Readiness Seminar with Market Participants on November 4, 2019
- Winter Readiness Survey
  - ISO-NE distributed a Winter Generator Readiness Survey to all generating resources in the region on October 30, 2019 based upon recommendations from the 2019 FERC and NERC Staff Reports
  - Survey was reviewed with the NEPOOL RC prior to implementation
- Opportunity Cost Enhancements (first implemented in 2018)
  - Enhances ability of resources to include fuel-related opportunity costs in energy supply offers

Winter Preparations - cont'd

- Pay for Performance (PFP)
  - Provides incentives for resources to perform under scarcity conditions
- OP-21 Enhancements
  - Provided market participants with a weekly 21-day look ahead of forecasted system conditions, and therefore an opportunity for Market Participants to take action in advance of an Energy Emergency
  - The process will move to daily updates if/when Energy Alert or Emergency conditions are triggered

Coordination and Communication

ISO-NE continues to enhance communications through:

- Regular conference calls with NPCC Reliability Coordinators
- Pre-winter conference calls with the Northeast Gas Association (NGA) via the Electric/Gas Operations Committee (EGOC)
  - Emphasizing coordination regarding winter forecasts and infrastructure outages
- Regular communications with natural gas pipelines
  - ISO-NE Information Policy changes were made to improve electric-gas coordination per FERC Order 787

Transmission & Distribution

Load shed plans tested monthly and consider

- Electric generators
- Gas wellheads
- Gas pipeline compressors
- Gas gathering facilities
- Other critical and essential loads

Actions & Plans

Seasonal Preparations

- Assess generator outages
- Gas pipeline communications
- Transmission system preparedness check
- Other Readiness Actions
  - Dual fuel testing
  - Blackstart resource testing
  - Calls to dual fuel generators